

**SYSTEM AND METHOD FOR DETERMINING PERFORMANCE LEVEL
CAPABILITIES IN VIEW OF PREDETERMINED MODEL CRITERIA**

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to United States Provisional Patent Application No. 60/421,101 filed October 25, 2002, which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The invention is drawn generally to the certification of business practices through maturity models and more particularly to the tracing of a company's practices to the those of at least one designated maturity model.

Description of the Related Art

[0003] Currently, many contracting parties require potential contractors to be certified at pre-defined levels of one or more maturity models. The basis for many maturity models is Carnegie Mellon's Software Engineering Institute's (SEI) Capability Maturity Model (CMM) Version 1.1 for software released in 1993, which is incorporated herein by reference in its entirety.

Variations on the original CMM as well as other specialized maturity models have since been developed to aid contracting parties and contractors alike in determining and certifying the engineering maturity of a specific contractor. For example, based on the original CMM, Capability Maturity Model Integration (CMMI), P-CMM People Capability Maturity Model, SA-CMM Software Acquisition Capability Maturity Model, SE-CMM Systems Engineering Capability Maturity Model, and IPD-CMM Integrated Product Development Capability Maturity

Model have since been developed. Similarly, many other maturity models, based, for example, on industry standards, are also recognized. Contracting parties select one or more of these maturity models based on the work product sought and specify that potential contractors responding to requests for proposals or requests for bids meet a predetermined level within the selected model or models. Consequently, potential contractors spend a significant amount of time and money attempting to determine their level within a particular model and obtain certification. In some cases, a single company may be involved in trying to certify their maturity against numerous models at the same time. Considering that each model specifies a different set of "best practices" requirements, contractors must attempt to trace their individual business practices to each set of "best practices" for each model.

SUMMARY OF THE INVENTION

Summary of the Problem

[0004] The current mechanical, i.e., human, systems and methods for tracing a company's practices to the categorical best practice requirements of numerous maturity models is time-consuming and inefficient. There is a need for a system and method that are user friendly and efficient for mapping the know-how of a company with the requirements for achieving desired levels within maturity models.

Summary of the Invention

[0005] An embodiment of the present invention describes a method for approximating the maturity of a company in view of at least one maturity model. This method includes establishing generalized work products; relating individual requirements of the at least one maturity model to

the generalized work products; and providing company-specific work products. The method further includes associating the company-specific work products to the generalized work products, tracing the company-specific work products to the individual requirements of the at least one maturity model through the association of the company-specific work products to the generalized work products, and providing an indicator of the approximate maturity of the company in view of the at least one maturity model.

[0006] In a further embodiment, the maturity of the company is approximated in view of at least two maturity models.

[0007] In further embodiments, the at least one maturity model includes multiple levels of maturity, wherein the indicator of the approximate maturity is indicative of the highest of the multiple levels of maturity attained by the company. The indicator of approximate maturity may be a percentage.

[0008] In still a further embodiment, the indicator of approximate maturity is provided in a report and the report includes a list of the individual requirements of the at least one maturity model that were not traceable to at least one of the company-specific work products.

[0009] In yet another embodiment, according to the method, the generalized work products, the individual requirements of the at least one maturity model and the company-specific work products are updated on a periodic basis.

[0010] Another embodiment of the present invention describes a system for approximating the maturity of a company in view of at least one maturity model. The system includes at least one means, e.g., server(s) or the like, for storing data representative of generalized work products, data representative of individual requirements for the at least one maturity model and data representative of the company-specific work products. The system further includes at least one

relationship database for relating the data representative of generalized work products to the data representative of individual requirements for the at least one maturity model; an application for prompting the association of the data representative of the company-specific work products to the data representative of generalized work products; an application for tracing the data representative of the company-specific work products to the data representative of individual requirements for the at least one maturity model; and an application for providing an indicator of the approximate maturity of the company in view of the at least one maturity model.

[0011] Further to this embodiment, the system may include a user interface. The user interface may be a computer that includes a processor, at least one data input means such as a keyboard, a network connection, and port, e.g., I/O, USB, serial, parallel, etc. and at least one data output means, e.g., screen, printer, etc.

[0012] Yet another embodiment of the present invention describes a method for using a maturity tracing system in order to determine the approximate maturity level of an organization in view of at least one maturity model. The method includes entering data indicative of organization-specific work products into the maturity tracing system through a user interface and associating the organization-specific work products with pre-existing generalized work products provided on the maturity tracing system through the user interface. Upon request, the system traces the organization-specific work products to maturity requirements for the at least one maturity model through the user interface using at least one application for relating the pre-existing generalized work products to the maturity requirements for the at least one maturity model. The method further includes requesting a report indicating the approximate maturity level of the organization in view of at least one maturity model through the user interface.

[0013] Detailed descriptions of the summarized embodiments are described below.

BRIEF DESCRIPTION OF THE FIGURES

In the Figures:

Figure 1 is an exemplary representation of the relationships that define the systems and methods of the present invention;

Figure 2 is a top-level tracer database schematic according to an embodiment of the present invention;

Figures 3(a)-3(b) show a table-based relational architecture according to an embodiment of the present invention; and

Figures 4-20 are representative screen shots of an exemplary process flow according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0014] The **Tables** set forth below are intended to define terminology and abbreviations utilized with respect to the specification and the **Figures** to describe the exemplary embodiment. These **Tables** are in no way intended to limit the scope of the invention, but rather are intended to aid the reader in understanding the exemplary embodiment. **Table 1** presents abbreviations, meanings and definition comments for general abbreviations used throughout this specification. **Tables 2-5** present individualized abbreviations, meanings and definition comments for a representative organization X's process and three (3) recognized maturity models SE-CMM, FAA-iCMM and CMMI. One skilled in the art understands the variations to **Tables 1** through **5** that would be within the scope of the invention as well as the limitless possibilities for additional tables depending on the certification sought by the organization.

Table 1

Abbreviation	Meaning	Comment
General		
PK	Primary Key	The column of the table on which the data is indexed
FK	Foreign Key	The referenced index number from another table
Arrow	Relationship	One record is related to many records in the table on the point end of the arrow
Tables		
Work Product Table		Identifies all the work products associated with all models in the tool, and allows the user to associate organizational work products to those listed in the table.
WPID	Work Product Identifier	Numeric Identification of each work product
WPName	Work Product Name	The name of the work product
ModelTypes Table		Identifies the model types loaded into the tool
ModelAbbrv	Model Abbreviation	Common Abbreviation for the models e.g. CMMI®
ModelName	Model Name	Full name of the model e.g. Capability Maturity Model Integrated ®

Table 2

User Organization (X's) Tables – Contain information relevant to the user-organization's processes		
Process Type Table		Identifies the type of process: Organizational, Project, Engineering, Support
PTAbbrv	Process Type Abbreviation	e.g. O for "Organization"
PtypTitle	Process Type Title	e.g. Organization
X Category Table		Further decomposition of the process type
PTAbbrv	Process Type Abbreviation	e.g. O

User Organization (X's) Tables – Contain information relevant to the user-organization's processes		
XCid	Category ID	e.g. EI for "Enterprise Integration"
XCatTitle	Category Title	e.g. Organization Enterprise Integration
X Activity Table		Identifies the process activities for each Process Category
PTAbbrv	Process Type Abbreviation	e.g. O
XCid	Category ID	e.g. EI
XAid	Activity ID	Numeric identifier of the Activity
XActivity	The title of the Activity	e.g. Establish Vision, Goals & Objectives
XStep Table		Identifies the steps of the process activity
PTAbbrv	Process Type Abbreviation	e.g. O
XCid	Category ID	e.g. EI
XAid	Activity ID	Numeric identifier of the Activity
XStepid	Step ID	Numeric identifier of the step
XStep	Step Title	e.g. Identify stakeholders
XActWPJoin Table		The relational table that joins work products in the work product table to the associated Organizational process activity
JoinID	Primary Key that identifies the relationship records	Unique numeric identification of the association between the work product table and the associated organizational process activity
XProdID	Organizational Product ID	Numeric Identifier of the Organization's Work Products
PTAbbrv	Process Type Abbreviation	e.g. O
XCid	Category ID	e.g. EI
XAid	Activity ID	Numeric identifier of the Activity
XProducts Table		This table lists the work products produced by the organization
XProdID	Organizational Product ID	Numeric Identifier of the Organization's Work Products
XProdName	Organizational Product Name	Name of the Organization's work product

User Organization (X's) Tables – Contain information relevant to the user-organization's processes		
WPJoinXProd Table		This table records the association between the Organization's work products and the various Models' recommended work products
Wjoin	Primary Key	Unique numeric identifier for each association of an organization's work product with a model's recommended work product
WPID	Work Product Identifier	Numeric Identification of each work product
XProdID	Organizational Product ID	Numeric Identifier of the Organization's Work Products

Table 3

SE-CMM® Process Model Tables		
SEProcessAreas Table		Identifies the Process Areas of the SE-CMM®
SEPANo	SE-CMM® Process Area Number	Numeric identification of the SE-CMM® Process Areas
SEPATitle	SE-CMM® Process Area Title	Titles of the SE-CMM® Process Areas
PTAbbrv	Process Type Abbreviation	e.g. O
SECMMBasePractices Table		Identifies the base practices of the SE-CMM® Model
SEPANo	SE-CMM® Process Area Number	Numeric identification of the SE-CMM® Process Areas
BPNo	SE-CMM® Base Practice Number	Numeric identification of the SE-CMM® Base Practice
BPTitle	SE-CMM® Base Practice Title	Titles of the SE-CMM® Base Practices
SEBPWPJoin Table		Relational table that associates the Base Practices to the Work Products in the Work Product Table
JoinID	Primary Key	Unique numeric identification of the association between the Base Practice and Work Product

SE-CMM® Process Model Tables		
SEPANo	SE-CMM® Process Area Number	Numeric identification of the SE-CMM® Process Areas
BPNNo	SE-CMM® Base Practice Number	Numeric identification of the SE-CMM® Base Practice
WPID	Work Product Identifier	Numeric Identification of each work product
SECMMCapabilityLevels Table		These tables capture the SE-CMM® model's measurement of capability assessment levels. This one identifies the 6 levels
SECMMCLNo	SE-CMM® Capability Level number	Numeric: 0-5
SECMMCLTitle	SE-CMM® Capability Level Title	Title of the capability level
SECMMComonFeatures Table		Identifies the common features for each capability level
SECMMCLNo	SE-CMM® Capability Level number	Numeric: 0-5
SECMMCFNo	SE-CMM® Common Feature Number	Numeric identification of the common feature
SECMMCFTitle	SE-CMM® Common Feature Title	Title of the common feature
SECMMGenericPractices Table		Identifies the generic practices that are associated with each common feature
SECMMCLNo	SE-CMM® Capability Level number	Numeric: 0-5
SECMMCFNo	SE-CMM® Common Feature Number	Numeric identification of the common feature
SECMMGPNo	SE-CMM® Generic Practice Number	Numeric identification of generic practices associated with each common feature
SECMMGPTitle	SE-CMM® Generic Practice Title	Title of the generic practice
SECMMPAJoinSECMMGP Table		Table associates the General Practice with the Process Areas of the SE-CMM® model

SE-CMM® Process Model Tables		
JoinID	Primary Key	Unique numeric identification of the association between the Practice Area and the Generic Practice
SEPANo	SE-CMM® Process Area Number	Numeric identification of the SE-CMM® Process Areas
SECMMCLNo	SE-CMM® Capability Level number	Numeric: 0-5
SECMMCFNo	SE-CMM® Common Feature Number	Numeric identification of the common feature
SECMMGPNo	SE-CMM® Generic Practice Number	Numeric identification of generic practices associated with each common feature

Table 4

FAA iCMM® Process Model Tables		
iCMMProcessAreas Table		Identifies the Process Areas of the FAA's iCMM® Model
iCPANo	iCMM® Process Area Number	Numeric identification of the iCMM® Process Area
iCPATitle	iCMM® Process Area Title	Title of the process area from the iCMM®
PTAbbrev	Process Type Abbreviation	e.g. O
iCMMBasePractices Table		Identifies the Base Practices of the iCMM®
iCPANo	iCMM® Process Area Number	Numeric identification of the iCMM® Process Area
iCBPNo	iCMM® Base Practice Number	Numeric identification of the iCMM® Base Practices associated with each Process Area
iCBPTitle	iCMM® Base Practice Title	Title of the base practice from the iCMM®
iCBPWPJoin Table		Table associates the iCMM® Base Practice with Work Products
JoinID	Primary Key	Unique numeric identification of the association between the Base Practice and the Work Product

FAA iCMM® Process Model Tables		
iCPANo	iCMM® Process Area Number	Numeric identification of the iCMM® Process Area
iCBPNo	iCMM® Base Practice Number	Numeric identification of the iCMM® Base Practices associated with each Process Area
WPID	Work Product Identifier	Numeric Identification of each work product
iCMMCapabilityLevels Table		These tables capture the iCMM® model's measurement of capability assessment levels. This one identifies the 6 levels
iCMMCLNo	iCMM® Capability Level number	Numeric: 0-5
iCmmCLTitle	iCMM® Capability Level Title	Title of the capability level
iCMMGenericPractices Table		Identifies the generic practices that are associated with each Capability Level
iCMMCLNo	iCMM® Capability Level number	Numeric: 0-5
iCMMGPNo	iCMM® Generic Practice Number	Numeric identification of generic practices associated with each Capability Level
iCMMGPTitle	iCMM® Generic Practice Title	Title of the generic practice
iCMMPAJoiniCMMGP Table		Table associates the General Practice with the Process Areas of the iCMM® model
JoinID	Primary Key	Unique numeric identification of the association between the Practice Area and the Generic Practice
iCMMCLNo	iCMM® Capability Level number	Numeric: 0-5
iCMMGPNo	iCMM® Generic Practice Number	Numeric identification of generic practices associated with each Capability Level
iCPANo	iCMM® Process Area Number	Numeric identification of the iCMM® Process Area

Table 5

SEI CMMI® Process Model Tables		
CMMIProcessAreaCategory Table		Identifies the process area categories in the SEI's CMMI® Process Model
CMMID	Primary Key	Numeric identifier of the process area category
Title	Title	Title of the Process Area Category
CMMIProcessArea Table		Identifies the Process Areas within each Process Area Category of the CMMI®
PAAbbrev	Process Area Abbreviation	Acronym identifying the process area
Title	Title	Process Area Title
CMMID	Foreign Key	Numeric identifier of the process area category
CmmiGoals Table		Identifies the goals associated with each process area of the CMMI®
PAAbbrev	Process Area Abbreviation	Acronym identifying the process area
GABB	Goal/Practice Number	Numeric identifier Stating whether the record is a goal or a practice
GoalNumber	Goal Number	Numeric identifier of the goal
GoalTitle	Goal Title	Title of the Goal
PracNumber	Foreign Key	Numeric identifier of the practice
CLNumber	Capability Number	Numeric identifier of the Capability Level
CMMIGoal_PracticeType Table		Provides two records to identify whether a record is a goal or a practice in the CMMI® Process Model
GABB	Goal/Practice Number	Numeric identifier Stating whether the record is a goal or a practice.
GoalTitle	Goal Title	e.g. Goal or Practice
CMMICapabilityLevel Table		Identifying Capability Levels as identified in the CMMI® Process Model
CLNumber	Capability Level Number	Numeric Identifier of Capability Level e.g. 0-5
Capability	Capability Title	Capability title

SEI CMMI® Process Model Tables		
CmmiPractices		Table identifying the Base Practices of each Process Area of the CMMI® Process Model
PAAbbrv	Process Area Abbreviation	Acronym identifying the process area
GABB	Goal/Practice Number	Numeric identifier Stating whether the record is a goal or a practice
GoalNumber	Goal Number	Numeric identifier of the goal
PracNumber	Foreign Key	Numeric identifier of the practice
CLNumber	Capability Number	Numeric identifier of the Capability Level
Title	Title	Base Practice Title
CMMIWPJoin Table		Table associates the CMMI® Base Practice with Work Products
JoinID	Primary Key	Numeric identifier of the records associating Base Practices with CMMI® Suggested Work Products
PAAbbrv	Process Area Abbreviation	Acronym identifying the process area
GABB	Goal/Practice Number	Numeric identifier Stating whether the record is a goal or a practice
PracNumber	Foreign Key	Numeric identifier of the practice
CLNumber	Capability Number	Numeric identifier of the Capability Level
WPID	Work Product Identifier	Numeric Identification of each work product
GoalNumber	Goal Number	Numeric identifier of the goal
CMMISubPractices Table		Table identifying the sub practices associated with each Base Practice of the CMMI® Process Model
PAAbbrv	Process Area Abbreviation	Acronym identifying the process area
GABB	Goal/Practice Number	Numeric identifier Stating whether the record is a goal or a practice
GoalNumber	Goal Number	Numeric identifier of the goal
PracNumber	Foreign Key	Numeric identifier of the practice

SEI CMMI® Process Model Tables		
CLNumber	Capability Number	Numeric identifier of the Capability Level
SubNo	Sub Practice Number	Numerical identifier of a sub practice associated with a Base Practice
SubPracTitle	Sub Practice Title	Sub Practice Title

[0015] In a first exemplary preferred embodiment of the present invention, a process for tracing a company's work products to the equivalent work product element requirements for individual maturity models is described. Referring to **Figure 1**, the embodiments of the present invention facilitate the tracing of a contractor's work products to the required elements of at least one maturity model, i.e., CMM-based, or maturity model equivalent, e.g., contractor operational processes and ISO (International Standards Organization) requirements. As discussed in the background of the invention, there are numerous maturity models, both formal and informal, that are often used by contracting parties to assess and filter out potential contractors. By way of specific example and for context, many government agencies require that in order to bid on certain high dollar contracts (hereafter "High K"), e.g., for developing systems or software, that the contractor must be certified at a CMM level three (3), but the agency does not specify which CMM-based maturity model level 3 must be achieved. As referenced above in the background of the invention, there are numerous CMM-based maturity models, e.g., Capability Maturity Model Integration (CMMI), SW-CMM Capability Maturity Model for Software, P-CMM People Capability Maturity Model, SA-CMM Software Acquisition Capability Maturity Model, SE-CMM Systems Engineering Capability Maturity Model, and IPD-CMM Integrated Product Development Capability Maturity Model. Further, each of these different maturity models, though similar in many requirements, still vary with respect to certain essential elements. Thus,

a potential contractor seeking to bid on a particular High K, seeks to be certified at a level 3 of at least one of the many CMM-based maturity models. Alternatively, different contractors may require varying levels certification within a specific maturity model. Additionally, contractors, who have invested in supporting one maturity model, can use the features of the system and method described herein to initially assess their potential against one or more additional specific maturity models or standards embodied in the system of the present invention.

[0016] Referring to **Figure 2**, a top-level tracer database schematic for the tracing process according to an embodiment of the present invention is shown. Specifically, a user, i.e., contractor, interacts with the tracer database via a main graphical user interface (GUI) 10. The GUI is part of a user interface device, such as a computer (not shown). The user interface device comprises a processor, at least one data input means, e.g., a keyboard, a network connection, port, i.e., I/O, USB, serial, parallel, etc. and at least one data output means such as a screen and printer. These types of data input and output devices are well known to those skilled in the art and will not be described further herein. Through the main page presented via the main GUI, a user is presented with "What to Do?" 12, choices include, adding data 14, associating data 16 and querying data 18. If a user chooses to add data, the model selection GUI 20 asks the user to "Select Model" 22. The database contains required element data for the user, i.e., the user's organization X, and one or more maturity models or the equivalent to a maturity model. In the exemplary database of **Figure 2**, the user may select from SE-CMM, the iCMM, e.g., the Federal Aviation Administration's integrated CMM, and CMMI. For the SE-CMM, the iCMM and the CMMI, the user further elects between "Domain or Generic" 24 for the type of data being added. Depending on the user's selection, the appropriate GUI is presented for data entry, e.g., X's Data Input GUI 26, SE-CMM Data Input GUI 28, SE-CMM GP (Goals/Procedures) Data Input GUI

30, iCMM Data Input GUI 32, iCMM GP Data Input GUI 34, CMMI Data Input GUI 36, and CMMI GP Data Input GUI 38. Additionally, in response to "What to Do?" 12, the user may choose to associate data, i.e., between maturity model data and the user's work product data. The user selects at least one maturity model with which the user wishes to associate the user's data 40 and is presented with the data association GUI 42 for the selected model and ultimately with at least one association instructions GUI 44. Finally, in response to "What to Do?" 12, the user may query data in the database through a query data GUI 46.

[0017] The top-level tracer database GUI schematic described above with reference to **Figure 2** is supported by a table-based relational architecture such as that described with respect to **Figures 3(a) and 3(b)**. Tables 1 through 5 described above provide a description for the individual abbreviations and the terminology utilized within the related tables set forth in **Figures 3(a) and 3(b)**. **Figures 3(a) and 3(b)** indicate the relationships between related tables as illustrated through the arrows. Though the architecture set forth in **Figures 3(a) and 3(b)** includes only three (3) exemplary models, i.e., SE-CMM, CMMI and iCMM, there is no limit to how few or how many models are related through the architecture. Ultimately, the tracer system described herein is capable of relating and associating all specific work products identified through the individual models with the specific work products of a user set forth in related table 68 which records the association between the user's specific work products, i.e., "Xproducts," and the recommended work products, i.e., "WP," from the various models.

[0018] Initially, a user identifies the processes, activities and work products of the user's organization X through related databases 56 to 64. Related table 54 includes the various process types identified through the architecture, e.g., organizational, project, engineering, support, etc., and related table 56 further identifies process categories with the defined process types.

Similarly, related table **58** identifies process activities associated with the process categories and related table **60** identifies steps of the process activities of related table **58**. Related table **62** joins X's process activities to X's work products of related table **64**.

[0019] The work products of X in related table **64** are ultimately associated through the system and process of the present invention with the work products of each of the models identified within the system architecture in related table **66** through related table **68**. Related table **66** is populated with the work products of each of the models. By way of specific example, according to the exemplary embodiment of the tracer system, the process recommendations of a particular model are related as follows with respect to the SE-CMM model. Incorporated herein by reference is the document which provides an overall description of the principles and architecture upon which the SE-CMM is based, "A Systems Engineering Capability Maturity ModelSM Version 1.1." (hereafter "SE-CMM documentation"). At the time of filing this application, a copy of this document could be found at the following website address: <http://www.sei.cmu.edu/publications/documents/95.reports/95.mm.003.html>. Referring to **Table 2** above and **Figures 3(a)** and **3(b)**, related table **70** identifies and links to the particular process areas defined by the SE-CMM documentation on the domain side. Referring to the SE-CMM documentation, the numbered Process Areas ("PA") for the SE-CMM referenced through table **70** may include:

- PA 01: Analyze Candidate Solutions
- PA 02: Derive and Allocate Requirements
- PA 03: Evolve System Architecture
- PA 04: Integrate Disciplines
- PA 05: Integrate System
- PA 06: Understand Customer Needs and Expectations
- PA 07: Verify and Validate System
- PA 08: Ensure Quality

PA 09: Manage Configurations
PA 10: Manage Risk
PA 11: Monitor and Control Technical Effort
PA 12: Plan Technical Effort
PA 13: Define Organization's Systems Engineering Process
PA 14: Improve Organization's Systems Engineering Processes
PA 15: Manage Product Line Evolution
PA 16: Manage Systems Engineering Support Environment
PA 17: Provide Ongoing Skills and Knowledge
PA 18: Coordinate with Suppliers.

Additionally, for each of the Process Areas, the SE-CMM documentation describes the base practices associated therewith. Related table 72 includes the base practices associated with each of the process areas of related table 70. For example, given PA 01: Analyze Candidate Solutions, the base practices ("BP") associated therewith in related table 72 may include:

BP.01.01 Establish evaluation criteria based on the identified problem and its defined constraints;
BP.01.02 Define the general approach for the analysis, based on the established evaluation criteria;
BP.01.03 Identify alternatives for evaluation in addition to those provided with the problem statement;
BP.01.04 Analyze the competing candidate solutions against the established evaluation criteria;
BP.01.05 Select the solution that satisfies the established evaluation criteria; and
BP.01.06 Capture the disposition of each alternative under consideration and the rationale for the disposition.

The SE-CMM documentation describes the BPs associated with each PA identified. Further, the BPs are further defined according to typical Work Products related to the tracing system through related table 82. For example, Table 6 lists BPs with their typical work products.

Table 6

Base Practices (BPs)	Typical Work Products
BP.01.01 Establish evaluation criteria based on the identified problem and its defined constraints	<ul style="list-style-type: none"> • captured evaluation criteria • trade-study criteria • defect data-related criteria
BP.01.02 Define the general approach for the analysis, based on the established evaluation criteria	<ul style="list-style-type: none"> • trade-study approach • problem solving process
BP.01.03 Identify alternatives for evaluation in addition to those provided with the problem statement	<ul style="list-style-type: none"> • trade-study alternatives • decision tree
BP.01.04 Analyze the competing candidate solutions against the established evaluation criteria	<ul style="list-style-type: none"> • analyses of candidate solutions
BP.01.05 Select the solution that satisfies the established evaluation criteria	<ul style="list-style-type: none"> • trade study • rationale for preferred solution • description of the preferred solution
BP.01.06 Capture the disposition of each alternative under consideration and the rationale for the disposition	<ul style="list-style-type: none"> • evaluation of alternatives for the trade study • mathematical models of appropriate solutions • reports of prototype operation • results of tradeoff studies • other supporting data of all studies

[0020] Similarly, the SE-CMM documentation describes a link between the PAs and the capability levels ("CL"), 0-5; defined for the SE-CMM. Related tables 74 and 76 in Figure 3(b) include the CLs for the SE-CMM and the Common Features ("CF") associated with each of the CLs as shown in Table 7.

Table 7

Capability Level	Common Features
0 – Not Performed	None
1 - Performed Informally	• Base practices performed
2 - Planned and Tracked	• Planning performance • Disciplined performance • Verifying performance • Tracking performance
3 - Well Defined	• Defining a standard process • Perform the standard process
4 – Quantitatively Controlled	• Establishing measurable quality goals • Objectively managing performance
5- Continuously Improving	• Improving organizational capability • Improving process effectiveness

Additionally, each common feature is further detailed by one or more generic practices ("GP").

These generic practices are listed in related table 78. The relational database architecture includes related table 80 for associating the PA from related table 70 with the generic practices from related table 64. All of the information related to the PA, BP, CF, GP and ultimately CL defines the SE-CMM work products included in related table 66. The SE-CMM work products are associated with the base practices of SE-CMM from related table 72 within related table 82. Based on the associations set forth in related table 68, the system and method of the present invention provide the user with an indication of the capability level, 0-5 of the SE-CMM, at which the user's processes may be rated in view of the user's work products. This indication may be in the form of a percentage or the like.

[0021] The SE-CMM example set forth herein is repeated for each of the maturity models provided in the architecture. For the iCMM, related tables 84, 86, 88, 90, 92 and 94 populate related table 66 with the work products indicative of the iCMM and through related table 68, provide the user with an indication of the capability level, 0-5 of the iCMM, at which the user's

processes may be rated in view of the user's work products. Finally, for the example set forth in **Figures 3a – 3b**, related tables **96, 98, 100, 102, 104, 106, 108** and **110** populate related table **66** with the work products indicative of the CMMI and through related table **68**, provide the user with an indication of the capability level, 0-5 of the CMMI, at which the user's processes may be rated in view of the user's work products. At the time of drafting the present application, versions 1.0 and 2.0 of the FAA-iCMM documentation, which integrated various models in a single model, were accessible through the following website:

<http://www2.faa.gov/ipg/pif/icmm/index.cfm> (hereafter "iCMM documentation"). Versions 1.0 and 2.0 of the FAA-iCMM documentation are hereby incorporated by reference in their entirety. Similarly, at the time of filing, versions of the documentation for various CMMI models were accessible through the following website: <http://www.sei.cmu.edu/cmmi/models/models.html> (hereafter "CMMI documentation"). This documentation is incorporated herein by reference in its entirety. The information contained in the related databases is entered and edited on an as needed basis through a process flows such as that described with respect to **Figures 4-20**.

[0022] Referring to **Figures 4-20**, representative screen shots and an exemplary process flow are shown in order to illustrate exemplary user interfaces for data entry and information retrieval according to embodiments of the present invention. Referring to **Figure 4**, a user is presented with a screen for selecting what actions the user wishes to take, i.e., "What to Do?" as described with respect to **Figure 2**. Exemplary choices include "Add Data to the Model," "Query Data in the Model," "Associate Data in the Model," "Reports," and "EXIT the Program." As described above, there is no limitation on the number or type of models that may be included in the system. **Figure 5** represents an exemplary screen that is presented to the user when the user selects the "Add Data to the Model" choice from the initial screen. Further to **Figure 5** the user is presented

with the available models to which they may choose to add data, e.g., CMMI, iCMM, SE-CMM and ORG. In this representative process flow, when the user selects the CMMI model, the screen shown in **Figure 6** allows the user to add/edit CMMI data. As described above with reference to **Figure 3a**, particularly related tables 96 – 110, the CMMI model is guided by Process Area Categories, Process Areas, Goals, Practices and SubPractices, which ultimately correlate to capability levels 0-5. The particulars of this model and variations thereto may be found in the CMMI documentation that is incorporated herein by reference. **Figure 6** illustrates an exemplary format for allowing users to update the model information. Additionally, **Figure 6** presents the user with additional specific choices, such as, "Add/Edit SubPractices," "Add/Edit Process Area," and "Add/Edit Process Area Categories." Referring to **Figure 7**, should the user choose to "Add/Edit SubPractices," the screen shown further breaks down the descriptive information, allowing the user to add/edit the requirements at the models most basic level, i.e., at the subpractice level. Should the user elect to "Add/Edit Process Area" within the CMMI model, the user may see a screen such as that shown in **Figure 8**, wherein the current process areas are available for review. Finally, **Figure 9** facilitates the review of process area categories when the user selects "Add/Edit Process Area Categories" from the choices in **Figure 6**.

[0023] Referring to **Figure 5**, the user may alternatively or additionally, choose to add data to the iCMM model. As set forth through at least related tables 84 – 94 shown in **Figures 3a** and **3b**, the iCMM model is guided by Process Type, Process Areas, Base Practices and Generic Practices, which ultimately correlate to capability levels 0-5. The particulars of this model and variations thereto may be found in the iCMM documentation that is incorporated herein by reference. Referring to **Figure 10**, upon selecting the iCMM model, the user is presented with a

screen for reviewing and adding/editing iCMM domain practices according to Process Type, Process Area and Base Practices. Additionally, from the screen illustrated through **Figure 10**, the user may choose to add/edit data for the iCMM Generic Practices according to capability level as shown in **Figure 11**.

[0024] **Figures 12 and 13** illustrate exemplary screen shots for prompting a user to add/edit data for the user's organization. In these exemplary screen shots, the user reviews/adds/edits Process Type, Process Category, and Organizational Product data. This data is linked to the other tables in the tracing system through, for example, related tables **54 – 64** shown in **Figure 3a**. As one skilled in the art can appreciate, this data may vary widely from organization to organization and may include more detailed levels of data depending on the organization.

These variations are intended to be included within the scope embodiments set forth herein.

[0025] Finally, **Figures 14 through 16** set forth exemplary screens for the review of SE-CMM model data. As described in the exemplary embodiment set forth above and referenced in related tables **70 – 82** shown in **Figures 3a and 3b**, the SE-CMM model is guided by Domain Practices, Process Area, Base Practices, Work Products, Common Features, and Generic Practices, which ultimately correlate to capability levels 0-5. The screen shown in **Figure 14**, accessible from selecting SE-CMM through the screen shown in **Figure 5**, allows a user to review and add/edit to the Process Area and Base Practices data for the SE-CMM model and to access the Generic Practices data. Through selection of Generic Practices, the user can review and add/edit Common Practices and Generic Practices data via the screen shown in **Figure 15**. Additionally, the user may review and add/edit the Work Products associated with the Base Practices through the screen shown in **Figure 16**.

[0026] Referring again to the main screen shown in **Figure 4**, the user may choose to associate the products of the user's organization, i.e., manipulated through the screens shown in **Figures 12 and 13**, with the work products identified through the related databases of **Figures 3a and 3b** for the various models included in the tracing system through the screen shown in **Figure 17**. Similarly, the user may choose to disassociate previous associations when the user determines that the association is in error. As shown in **Figure 17**, the user may view and associate the user's organization's products with ALL model work products or on a model-by-model basis. Further, the system allows the user, through the screen shown in **Figure 18**, to trace individual organizational products to the generalized work products that are in turn traceable to criteria established for each model, i.e., SE-CMM Base Practices, CMMI Practices and iCMM Base Practices. By tracing the organization's products to the model criteria, the tracing system offers organizations an indication as to capability level achieved by the organization. Alternatively, instead of capability level, the tracing system offers an indication as to the standards reached for a particular standards model, e.g., ISO 9000. Further, the tracing system is able to give an indication as to organizational achievement within any model whose requirements are mapped to work products that can in turn be associated with the organization's products. Further still, once the organization's work products are associated with the general work products, the organization need not repeat the steps of entering and associating the organization's work products to the general work products in order to determine maturity level for a different model or standard, i.e., new or additional. The organization need only add and associate new or previously not entered organizational work products on a going-forward basis. New or additional model or standard maturity criteria is added through, for example, a software update, e.g., module, network download, or the like and the system's tracing function first

traces the new model or standard maturity criteria to the general work products and second traces the organization's work products automatically to the maturity criteria for the new model or standard.

[0027] Finally, through the main screen of **Figure 4**, the user is also able to select "Reports" which results in the screen shown in **Figure 19**. The "Unassigned Work Product" report accessible through **Figure 19** and shown on the screen of **Figure 20**, shows a user which of the work products encompassing the model requirements, have not yet been linked to an organization product. In essence, this list sets forth a to-do list for the organization. Presumably, if each of the work products can be associated to one or more of the organization's products, then the organization will have satisfied qualifications for the highest indicated capability level for each model within the tracing system. Additional reports may include other indicators of the company's maturity based on the tracing of the organization's work products to the model requirements. This indicator may be in the form of a percentage completed or the like for a specific level within the model.

[0028] In a further embodiment of the present invention, throughout the exemplary process described with respect to **Figures 4-20**, the user can gain additional information about the various practices, features, work products and the like for the models and the general practice areas by either passing the arrow over the words on the screen and/or by clicking on the words on the screen. In the former case, a pop-up window can be seen that elaborates on the selection, offering a more detailed definition and even examples of work products that would be traced to the practice or feature requirement. This same or additional information may also be accessed by clicking on the text of interest, wherein the user is linked through the network to the information, such as to a website containing a description of the particular model.

[0029] Utilizing the system and method of the present invention, the user is able to evaluate the organizations level of maturity with respect to various models in a timely and efficient manner, with high fidelity.

[0030] One skilled in the art understands the various hardware and software configurations that may be used to implement the databases and applications described herein. By way of example, the application can be run on any standard personal computer configured, at a minimum, with a Pentium III 266 megahertz CPU and 64 megabits of RAM, running Windows 98 or above and Internet Explorer 5.50 or above. Further, one skilled in the art recognizes that the embodiments set forth herein are intended to be exemplary. It is recognized that there are numerous modifications and variations to the exemplary embodiments that fall within the scope of the invention.